

## Factory Overhead Variances and Business Combinations

### Overview of Factory Overhead Variances

Factory overhead variances analyze the difference between actual and budgeted overhead costs, providing insights into cost control and production efficiency. Overhead includes both variable and fixed costs, typically applied based on an allocation base (e.g., machine hours or direct labor hours).

- **Definition:** Variance analysis for factory overhead compares actual overhead costs to standard costs in the flexible budget, broken down into sub-variances to identify specific causes of deviations.
- **Purpose:** Supports cost management by identifying inefficiencies in overhead spending or production volume, aiding in strategic decision-making.

### Factory Overhead Variance Structure

- **Total Overhead Variance:** Difference between actual total overhead (variable + fixed) and standard overhead applied for actual output.
- **Sub-Variations:**
  - **Total Variable Overhead Variance:**
    - **Spending Variance:** Due to differences in actual vs. standard variable overhead rates.
    - **Efficiency Variance:** Due to differences in actual vs. standard usage of the allocation base.
  - **Total Fixed Overhead Variance:**
    - **Spending (Budget) Variance:** Due to differences in actual vs. budgeted fixed overhead costs.
    - **Production-Volume Variance:** Due to differences between budgeted and applied fixed overhead based on actual output.

### Total Overhead Variance

- **Formula:**  
[  
$$\text{Total Overhead Variance} = \text{Actual Overhead} - \text{Standard Overhead Applied}$$
  
]
  - Actual Overhead = Actual Variable Overhead + Actual Fixed Overhead
  - Standard Overhead Applied = (Standard Variable Rate × Standard Hours Allowed) + (Standard Fixed Rate × Standard Hours Allowed)

### Total Variable Overhead Variance

- **Definition:** Difference between actual variable overhead costs and the flexible budget variable overhead for actual output (also called the flexible budget variance).
- **Formula:**  
[

$$\text{Total Variable Overhead Variance} = \text{Actual Variable Overhead} - (\text{Standard Variable Rate} \times \text{Standard Hours Allowed})$$

- **Sub-Variations:**

1. **Variable Overhead Spending Variance:**

- Measures the impact of paying a different rate than the standard rate for the allocation base.
- **Formula:**  
[  
$$\text{Spending Variance} = \text{Actual Variable Overhead} - (\text{Actual Hours} \times \text{Standard Variable Rate})$$
  
]

2. **Variable Overhead Efficiency Variance:**

- Measures the impact of using more or fewer units of the allocation base (e.g., machine hours) than the standard.
- **Formula:**  
[  
$$\text{Efficiency Variance} = (\text{Actual Hours} - \text{Standard Hours Allowed}) \times \text{Standard Variable Rate}$$
  
]

### Total Fixed Overhead Variance

- **Definition:** Difference between actual fixed overhead costs and the fixed overhead applied based on standard hours for actual output.
- **Formula:**  
[  
$$\text{Total Fixed Overhead Variance} = \text{Actual Fixed Overhead} - (\text{Standard Fixed Rate} \times \text{Standard Hours Allowed})$$
  
]
- **Sub-Variations:**

1. **Fixed Overhead Spending (Budget) Variance:**

- Measures the difference between actual and budgeted fixed overhead costs.
- **Formula:**  
[  
$$\text{Spending Variance} = \text{Actual Fixed Overhead} - \text{Budgeted Fixed Overhead}$$
  
]

2. **Fixed Overhead Production-Volume Variance:**

- Measures the difference between budgeted fixed overhead and applied fixed overhead due to actual output differing from budgeted output.

- Formula:  
[  
$$\text{Production-Volume Variance} = (\text{Budgeted Hours} - \text{Standard Hours Allowed}) \times \text{Standard Fixed Rate}$$
  
]

#### Total Overhead Flexible Budget Variance

- Definition:** Combines variable overhead spending, variable overhead efficiency, and fixed overhead spending variances to reflect controllable costs.
- Formula:**  
[  
$$\text{Total Overhead Flexible Budget Variance} = \text{Variable Overhead Spending Variance} + \text{Variable Overhead Efficiency Variance} + \text{Fixed Overhead Spending Variance}$$
  
]

#### Variance Analysis Methods

- 4-Way Analysis:** Separately analyzes all four sub-variances (variable spending, variable efficiency, fixed spending, fixed volume).
- 3-Way Analysis:** Combines variable spending and efficiency into a single controllable variance, plus fixed spending and volume variances.
- 2-Way Analysis:** Combines variable and fixed spending into a single spending variance, plus the production-volume variance.
- Controllable Variance:** Equals the total overhead flexible budget variance (excludes production-volume variance).

#### Example: OPQ Company (Hypothetical Data)

- Scenario:** OPQ Company applies overhead based on machine hours. Budgeted data for 20X0:
  - Budgeted machine hours: 100,000
  - Budgeted variable overhead: \$100,000 (\$1 per machine hour)
  - Budgeted fixed overhead: \$200,000 (\$2 per machine hour)
  - Standard overhead rate: \$3 per machine hour (\$1 variable + \$2 fixed)
  - Standard hours per unit: 2 hours
  - Budgeted production: 50,000 units
  - Actual data: 48,000 units produced, 97,000 actual machine hours, actual variable overhead \$99,000, actual fixed overhead \$210,000.
- Calculations:**

#### 1. Total Overhead Variance:

- Actual Overhead = ( 99,000 + 210,000 = \$309,000 )
- Standard Hours Allowed = ( 48,000  $\times$  2 = 96,000 )

- Standard Overhead Applied = ( 96,000  $\times$  3 = \$288,000 )
- Total Variance = ( 309,000 - 288,000 = \$21,000  $\text{U}$  )

#### 2. Total Variable Overhead Variance:

- Actual Variable Overhead = \$99,000
- Standard Variable Overhead = ( 96,000  $\times$  1 = \$96,000 )
- Total Variable Variance = ( 99,000 - 96,000 = \$3,000  $\text{U}$  )

#### 3. Variable Overhead Spending Variance:

- Actual Variable Overhead = \$99,000
- Budgeted Variable Overhead for Actual Hours = ( 97,000  $\times$  1 = \$97,000 )
- Spending Variance = ( 99,000 - 97,000 = \$2,000  $\text{U}$  )

#### 4. Variable Overhead Efficiency Variance:

- Efficiency Variance = ( (97,000 - 96,000)  $\times$  1 = 1,000  $\times$  1 = \$1,000  $\text{U}$  )

#### 5. Total Fixed Overhead Variance:

- Actual Fixed Overhead = \$210,000
- Standard Fixed Overhead Applied = ( 96,000  $\times$  2 = \$192,000 )
- Total Fixed Variance = ( 210,000 - 192,000 = \$18,000  $\text{U}$  )

#### 6. Fixed Overhead Spending Variance:

- Spending Variance = ( 210,000 - 200,000 = \$10,000  $\text{U}$  )

#### 7. Fixed Overhead Production-Volume Variance:

- Budgeted Hours = ( 50,000  $\times$  2 = 100,000 )
- Volume Variance = ( (100,000 - 96,000)  $\times$  2 = 4,000  $\times$  2 = \$8,000  $\text{U}$  )

#### 8. Total Overhead Flexible Budget Variance:

- Flexible Budget Variance = ( 2,000  $\text{U}$  (VOH Spending)) + 1,000  $\text{U}$  (VOH Efficiency)) + 10,000  $\text{U}$  (FOH Spending)) = \$13,000  $\text{U}$  )
- Verification:** Total Overhead Variance = Flexible Budget Variance + Production-Volume Variance = ( 13,000 + 8,000 = \$21,000  $\text{U}$  )

#### Additional Insights

- Flexible Budget Integration:** Overhead variances use flexible budgets to adjust variable costs to actual output, isolating spending and efficiency effects.
- Controllable vs. Non-Controllable:** Spending and efficiency variances are controllable, while production-volume variance reflects capacity utilization (less controllable).

- **Corrective Actions:** Unfavorable spending variances may prompt cost reviews, while efficiency variances suggest process improvements.
- **Strategic Alignment:** Overhead variance analysis optimizes resource use, supporting cost management and profitability goals.

#### Business Combinations and Consolidations: Example Problem

##### Problem

**Scenario:** On January 1, 2025, Parent Co. acquires 100% of Sub Co. for \$30,000,000 in cash to expand into the electronics manufacturing market. Sub Co.'s net assets have a fair value of \$24,000,000, including a patent valued at \$5,000,000 with a 10-year useful life. Sub Co. applies overhead based on machine hours, with standard rates of \$3 variable and \$5 fixed per machine hour. Budgeted data: 20,000 units, 2 machine hours/unit, budgeted fixed overhead \$200,000. Actual data: 21,000 units produced, 43,000 machine hours, actual variable overhead \$130,000, actual fixed overhead \$205,000. Calculate goodwill, prepare the consolidation journal entry under US GAAP, compute factory overhead variances, and discuss how variance analysis supports post-acquisition performance evaluation.

##### Solution:

- Goodwill Calculation:**
  - Purchase price: \$30,000,000
  - Fair value of net assets: \$24,000,000
  - Goodwill = \$30,000,000 - \$24,000,000 = **\$6,000,000**
- Consolidation Journal Entry (US GAAP):**
- Dr Assets (excluding patent) 19,000,000
- Dr Patent 5,000,000
- Dr Goodwill 6,000,000
- Cr Cash 30,000,000
- Amortization of Patent (Year 1, US GAAP):**
  - Annual amortization = \$5,000,000 ÷ 10 years = \$500,000
- Dr Amortization Expense 500,000
- Cr Accumulated Amortization 500,000
- Factory Overhead Variances:**
  - Standard Hours Allowed = ( 21,000 \times 2 = 42,000 )
  - Budgeted Hours = ( 20,000 \times 2 = 40,000 )
  - Standard Overhead Rate = ( 3 \text{ (variable)} + 5 \text{ (fixed)} = \$8/\text{hour} )
- Total Overhead Variance:**

- Actual Overhead = ( 130,000 + 205,000 = \$335,000 )
  - Standard Overhead Applied = ( 42,000 \times 8 = \$336,000 )
  - Total Variance = ( 335,000 - 336,000 = -\$1,000 \text{ F} )
- Total Variable Overhead Variance:**
    - Actual Variable Overhead = \$130,000
    - Standard Variable Overhead = ( 42,000 \times 3 = \$126,000 )
    - Total Variable Variance = ( 130,000 - 126,000 = \$4,000 \text{ U} )
  - Variable Overhead Spending Variance:**
    - Budgeted Variable Overhead for Actual Hours = ( 43,000 \times 3 = \$129,000 )
    - Spending Variance = ( 130,000 - 129,000 = \$1,000 \text{ U} )
  - Variable Overhead Efficiency Variance:**
    - Efficiency Variance = ( (43,000 - 42,000) \times 3 = 1,000 \times 3 = \$3,000 \text{ U} )
  - Total Fixed Overhead Variance:**
    - Actual Fixed Overhead = \$205,000
    - Standard Fixed Overhead Applied = ( 42,000 \times 5 = \$210,000 )
    - Total Fixed Variance = ( 205,000 - 210,000 = -\$5,000 \text{ F} )
  - Fixed Overhead Spending Variance:**
    - Spending Variance = ( 205,000 - 200,000 = \$5,000 \text{ U} )
  - Fixed Overhead Production-Volume Variance:**
    - Volume Variance = ( (40,000 - 42,000) \times 5 = -2,000 \times 5 = -\$10,000 \text{ F} )
  - Total Overhead Flexible Budget Variance:**
    - Flexible Budget Variance = ( 1,000 \text{ (VOH Spending)} + 3,000 \text{ (VOH Efficiency)} + 5,000 \text{ (FOH Spending)} = \$9,000 \text{ U} )
  - Strategic and Variance Analysis Notes:**
    - **Variance Analysis:** The \$4,000 unfavorable variable overhead variance (\$1,000 spending, \$3,000 efficiency) indicates higher rates and inefficient machine hour usage, prompting cost reviews or process improvements. The \$5,000 favorable fixed overhead variance results from a \$10,000 favorable volume variance (higher output) offsetting a \$5,000 unfavorable spending variance.
    - **Flexible Budget:** Adjusts overhead costs to 21,000 units, isolating controllable variances for accurate evaluation.

- **Post-Acquisition Performance Evaluation:** Variance analysis supports **control** by identifying inefficiencies in Sub Co.'s overhead costs, ensuring alignment with Parent Co.'s cost management goals. It informs the **master budget** by refining overhead cost estimates.
- **Consolidation:** Eliminate Sub Co.'s equity accounts. Goodwill is tested annually for impairment, and the patent is amortized under US GAAP.
- **Strategic Alignment:** Overhead variance analysis ensures Sub Co.'s production is cost-efficient, supporting Parent Co.'s strategic objective of profitable expansion in the electronics market.